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June 19, 2002

Electronic Filing  
Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW, Room TWB-204  
Washington, DC 20554

Re: In the Matter of Review of Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers and Implementation of the Local Competition Provisions in the Local Telecommunications Act of 1996,  
CC Docket No. 96-98

In the Matter of Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC  
Docket No. 98-147

Dear Ms. Dortch:

Yesterday, Lawrence Kotlikoff, Professor of Economics at Boston University, and Joel Lubin, Rich Clarke, Scot Mollica, Steve Melo, Salman Abbasi, Rich Rubin and I, all of AT&T, and met the the following members of the Commission Staff: Barbara Cherry, Deputy Chief of the Office of Plans and Policy, Don Stockdale and Bill Sharkey, both of the Office of Plans and Policy, Jeff Goldthorp, Network Technology Division Chief, OET, Tom Navin, Jeremy Miller, Julie Veach, Ian Dillner, Daniel Shiman, Rob Tanner, Elizabeth Yockus, Jay Atkinson, and Dick Kwiatkowski, all of the Wireline Competition Bureau. During that meeting we discussed the information contained in the attached presentation.

The statements made by the AT&T representatives are reflected in AT&T's written submissions in the referenced proceedings. We shared the attached materials during the course of our discussion. In accordance with the Commission's rules, I have submitted one copy of this Notice for each referenced proceeding.

Sincerely,

cc: Barbara Cherry  
Jeff Goldthorp  
Julie Veach  
Rob Tanner  
Dick Kwiatkowski

Don Stockdale  
Tom Navin  
Ian Dillner  
Elizabeth Yockus

Bill Sharkey  
Jeremy Miller  
Daniel Shiman  
Jay Atkinson



# **Loop Electronic Access Provisioning:**

***Enabling the competitive all-service network of the future***

**Network Architecture  
& Technology Overview**

**June 18, 2002**

# Overview



⌘ Goals

⌘ Current roadblocks

⌘ LEAP solution

☑ Architecture

☑ Alternatives

☑ Required investments

☑ Implementation strategy

⌘ Benefits

# Engineering goals

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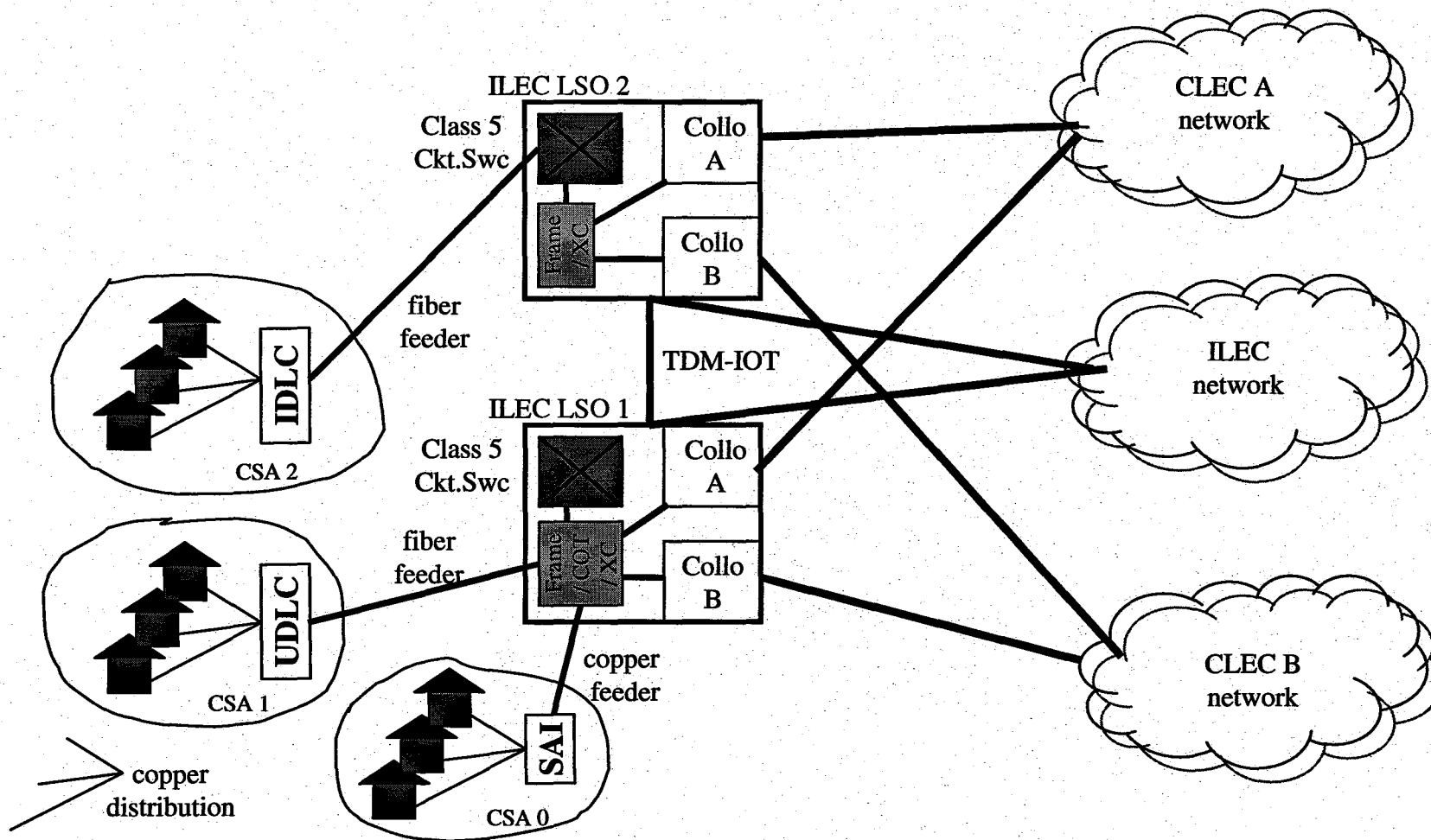
- ⌘ Want all lines to efficiently support DSL
  - ☑ Ability/speed depends on maximum copper distance
  - ☑ Without expensive/unreliable loop transfer process
- ⌘ Want all lines to be efficiently unbundlable
  - ☑ For both voice and data
  - ☑ Without expensive/unreliable transfer/hot cut process
- ⌘ Want all lines to support secure, converged packet-based network architecture of the future
  - ☑ Single loop network for voice and data
  - ☑ Integrated with efficient switching and interoffice networks

# Policy goals

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- ⌘ Want DSL available to all customers
  - ☐ Without regard to location
  - ☐ Scalable in capacity
  - ☐ At low cost in marketing and provisioning
- ⌘ Want to facilitate maximal level of competition
  - ☐ For both voice and data
  - ☐ Making most efficient use of network resources
- ⌘ Want to reinvigorate telecom investment
- ⌘ Want increased network reliability and security

# Current Carrier Serving Area (CSA) Architecture



# Current roadblocks

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## ⌘ Copper technology

- ☒ Length and quality of copper loops
- ☒ Needs hot cuts/loop transfers

## ⌘ UDLC technology

- ☒ Does not support DSL and provides inferior v.90 analog modem performance
- ☒ Needs hot cuts/loop transfers

## ⌘ IDLC/Pronto technology

- ☒ Not efficiently/economically unbundlable
- ☒ Inefficient duplication of network resources

## ⌘ Loop networks are "hardwired"

# Current technology scorecard

<i>Criteria</i>	<b>Cu &lt; 18 kft.</b>	<b>Cu &gt; 18 kft.</b>	<b>UDLC</b>	<b>IDLC/ Pronto</b>
<i>Support DSL?</i>	\$	X	X	+
<i>Support V/D Unbundling?</i>	\$	\$	\$	X
<i>Support Convergence?</i>	X	X	X	X

- X** Not feasible
- \$** Feasible only with hot cut/  
loop transfer/collocation
- +** Feasible

In addition, all of these current loop technologies are subject to single points of failure in the feeder network or at their serving central office



# LEAP technology advantages

<i>Criteria</i>	<b>Cu &lt; 18 kft.</b>	<b>Cu &gt; 18 kft.</b>	<b>UDLC</b>	<b>IDLC/ Pronto</b>	<b>LEAP</b>
<i>Support DSL?</i>	\$	X	X	+	+
<i>Support V/D Unbundling?</i>	\$	\$	\$	X	+
<i>Support Convergence?</i>	X	X	X	X	+

**X** Not feasible

**\$** Feasible only with hot cut/loop transfer/collocation

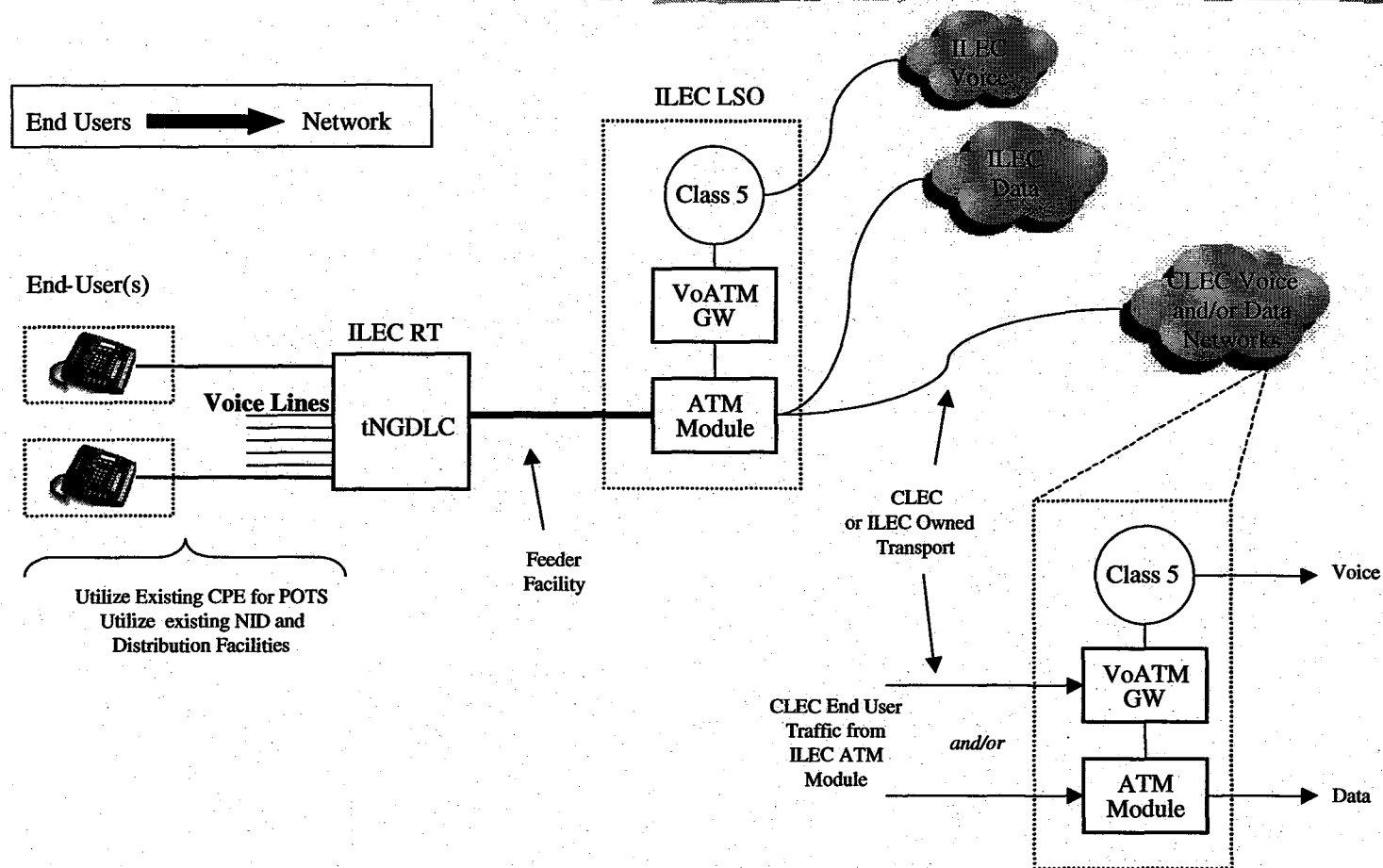
**+** Feasible

# LEAP architecture

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- ⌘ Base LEAP architecture vs. enhancements
- ⌘ Equipment changes by loop technology (OSP)
  - ☒ Copper
  - ☒ UDLC
  - ☒ IDLC/Pronto
- ⌘ Equipment changes in the central office (COE)
  - ☒ ATM module
  - ☒ Voice gateway
  - ☒ Reduced CLEC collocation requirements

# General LEAP Network Architecture



Note : The ELP architecture can be designed and engineered in several different ways. This is a general illustration of the ELP architecture and flow

# Impact on local network

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**The LEAP architecture alters existing local networks in three areas:**

*Outside Loop Plant:* **"true" NGDLC (tNGDLC) equipment** packetizes all end-user communications and connects copper wires serving the end user premises with fiber feeder facilities routed to the central office

*Central Office:* all subtending tNGDLC equipment is connected an **ATM module** -- to which all LECs interconnect for access to the "loops" serving retail customers. This ATM module is analogous to CO OCD equipment being deployed by the ILECs in their NGDLC architectures. Under LEAP, the ATM module functions as an "electronic" MDF.

*PSTN interface:* **VoATM gateways** to "translate" traffic between the packet-based LEAP architecture and a LEC's circuit switched network (e.g. Class 5)

# Impact on local network

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**Other than these three upgrades, the LEAP architecture preserves most of the existing local network investment :**

**CPE** remains unchanged for voice services. Compatible CPE needed for advanced services (e.g. high-speed data, derived voice lines, etc.)

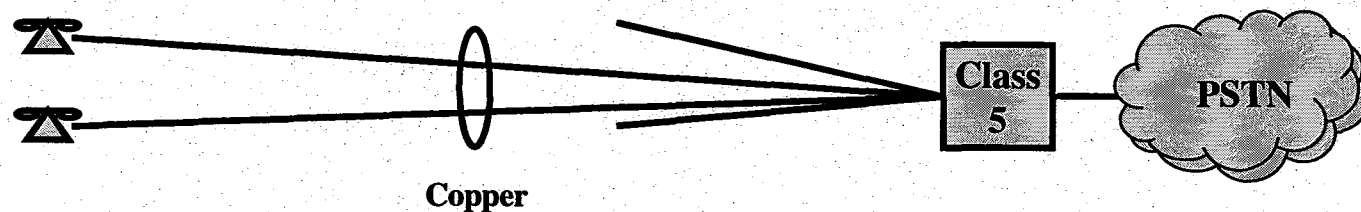
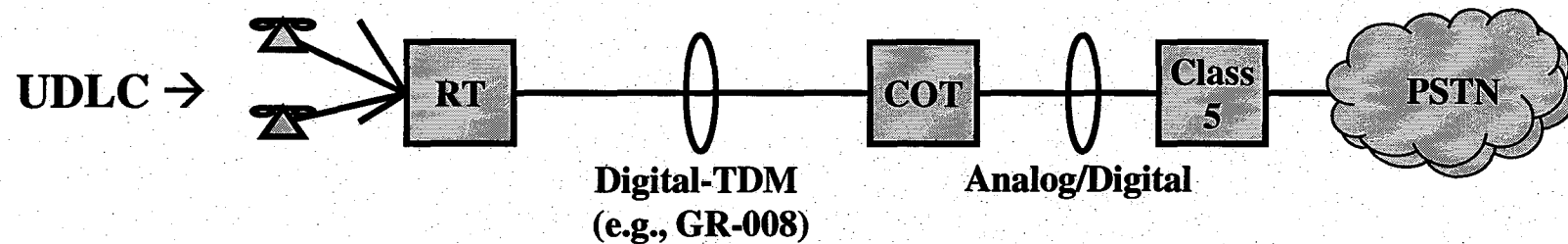
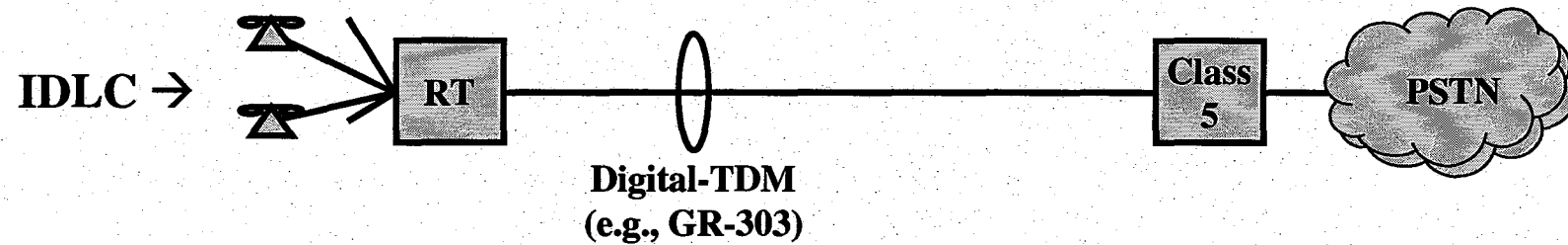
**Distribution facilities** (e.g. copper) from NID to RT remain unchanged

**Fiber feeder facilities**, between RT and CO, remain unchanged (copper feeders upgraded to fiber)

**LEAP is incremental to legacy DLC architectures and NGDLC architectures being deployed by the incumbents**

**For non-DLC loops (e.g. non-RT loops located close to the CO), LEAP tNGDLC would likely be deployed in the ILEC central office**

# Legacy voice loop topologies



# LEAP implementation scenarios

## **Fiber-fed IDLC/UDLC (DSL-ready)**

*OSP:* Voice-Packet-Processor (VPP) to convert narrowband voice to ATM

*COE:* ATM module

VoATM gateway to convert ATM cell stream to Class 5 interface  
(e.g. GR-303)

## **Non-Fiber fed IDLC/UDLC (not DSL-ready)**

*OSP:* ADSL-capable tNGDLC equipment with VPP  
Fiber feeder between the RT and CO

*COE:* Same as above

## **All-copper loops (non-DLC loops)**

*OSP:* ADSL-capable tNGDLC equipment with VPP (located in ILEC CO)

*COE:* Same as above

# Voice quality parity

**LEAP can be engineered by the ILECs to mitigate QoS concerns and to manage feeder facilities fairly and efficiently :**

**AT&T Labs Evaluation** Voiceband modem, facsimile and voice quality performance on VoATM loops found to be on par with existing/legacy loop technologies when using G.711 (PCM) codecs and when the network can guarantee QoS to the conforming ATM cell flow.

**Service Class** Support of VBR -rt and VBR -nrt ATM service classes by the ATM network enables QoS for delay sensitive NB voice traffic and loss sensitive BB data traffic, respectively.

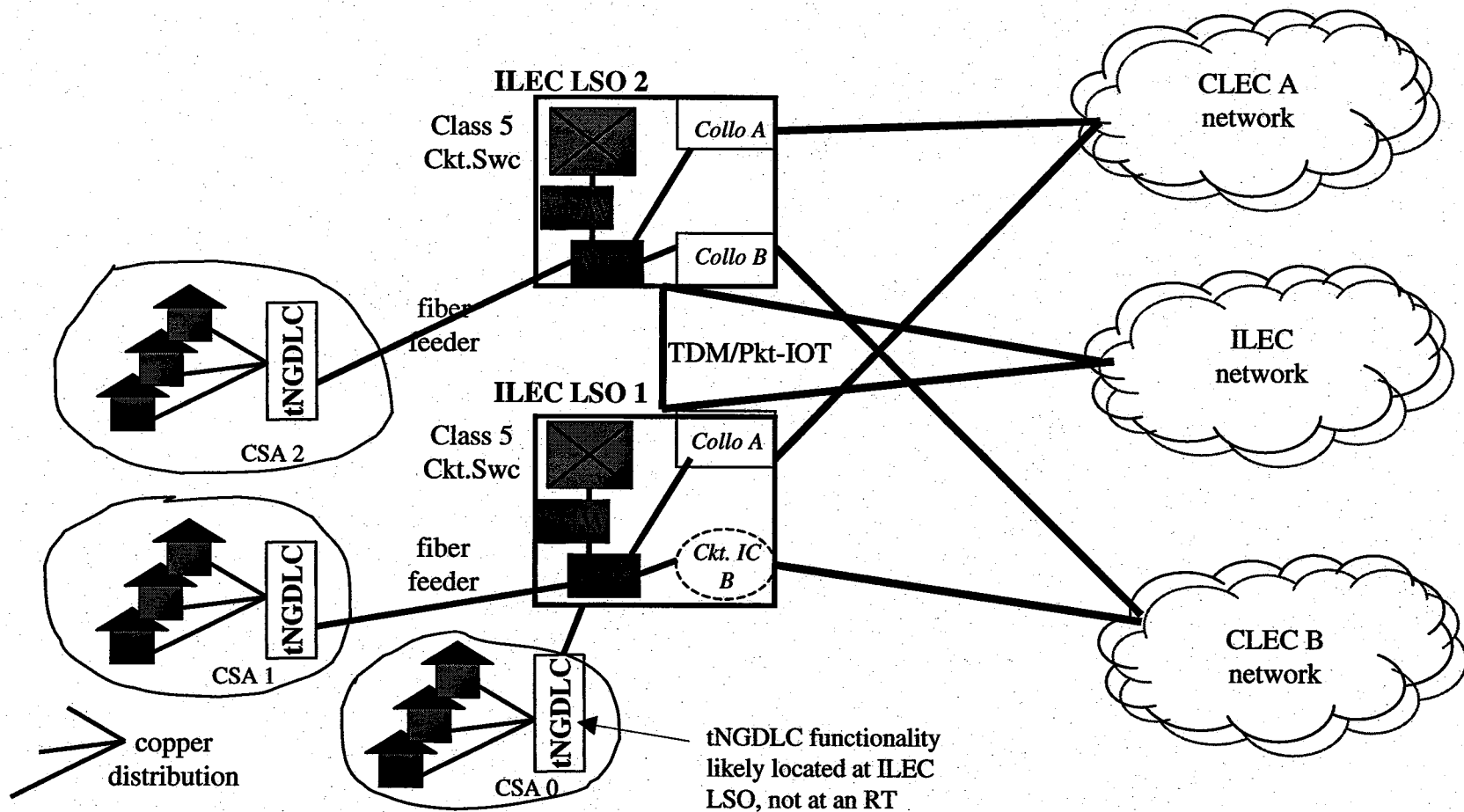
**VPC** Service provider would request an appropriately sized Virtual Path Connection. Engineer voice VPC bandwidth to meet CLEC call blocking performance requirements. Engineer data VPC bandwidth to allow data performance to meet CLEC requirements. CLEC determines oversubscription ratio → grade of service.

**VP policing** Allows the network to enforce traffic contracts. VBR services is the most efficient means to share feeder capacity.

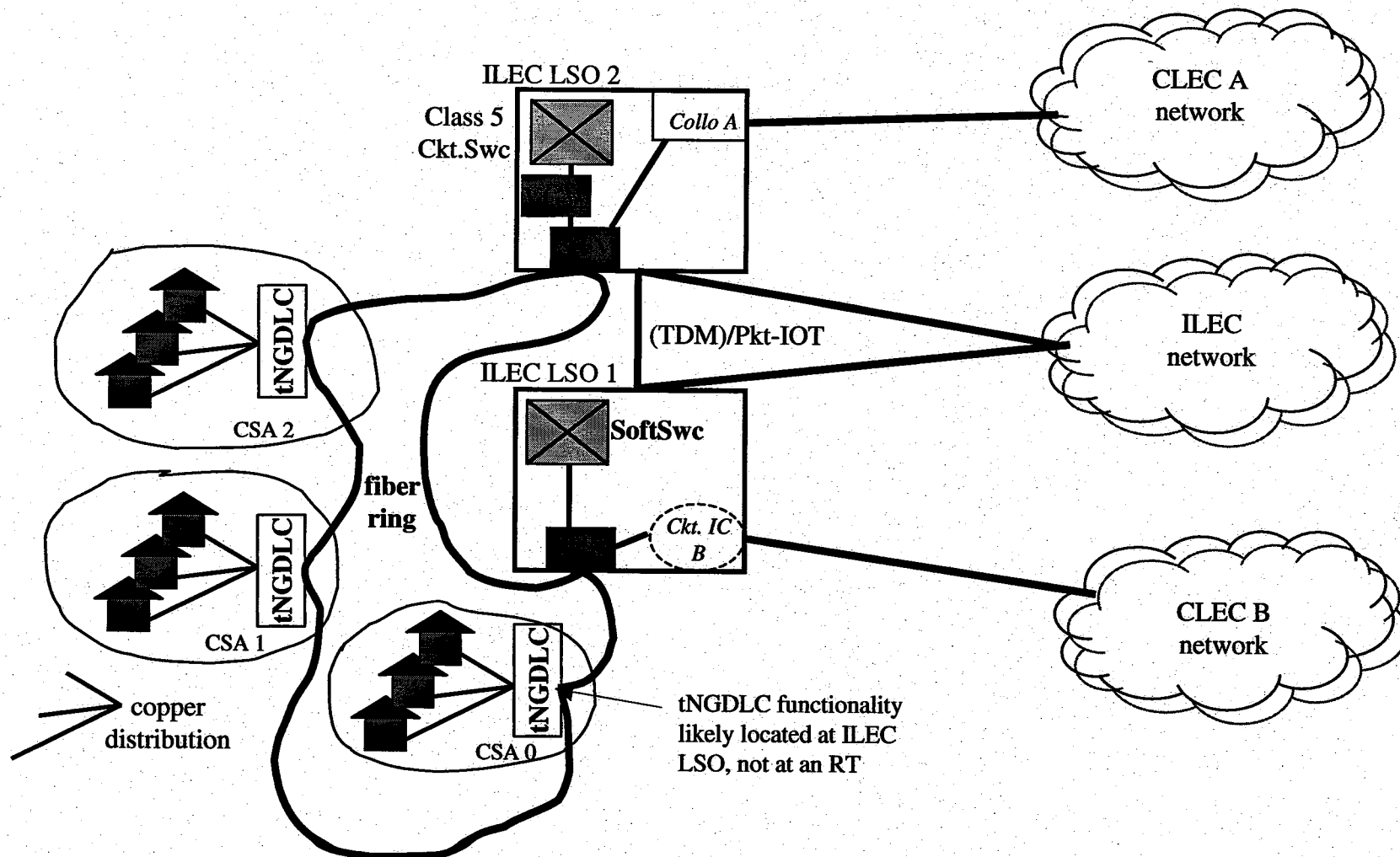
**VBR services** Will guarantee a Sustained Cell Rate and will allow other VP connections to "borrow" bandwidth from other VP connections that are not fully utilized.



# Base LEAP Architecture



# Possible LEAP Enhancements



# Alternatives to LEAP

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- ⌘ Unbundling GR-303 IDLC/Pronto
- ⌘ Use of central office grooming
- ⌘ Hybrid of GR-303/008 architecture
- ⌘ None of these are as effective or cost efficient as LEAP

# Required investments

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- ⌘ Measured for a forward-looking LEAP network relative to current forward-looking network
- ⌘ Current forward-looking network costed using UNE SynMod
  - ☑ No change to NID/loop distribution investments because are based on <18 kft. of clean copper
  - ☑ DLC investments adjusted to current GR-303 prices
  - ☑ Feeder remains copper/fiber – no concentration and no daisy-chaining
  - ☑ CO remains Class 5 circuit switch
  - ☑ SONET ring / TDM interoffice transport
  - ☑ SS7 signaling

# Required investments

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⌘ Forward-looking basic LEAP using UNE SynMod  
*(assuming DSL capability, but not actual DSL provisioning)*

☒ No change to NID/loop distribution investments

☒ Add tNGDLC investments on previous copper lines

☒ Substitute tNGDLC investments on previous fiber lines

☒ All feeders costed as fiber – no daisy-chaining

☒ Add ATM module and voice gateway at each CO

☒ CO remains Class 5 circuit switch

☒ SONET ring / TDM interoffice transport

☒ SS7 signaling

⌘ \$21B total or \$129/line increment over baseline  
for nonrural ILECs

# Additional ADSL investments

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⌘ Add cost of ADSL provisioning to basic LEAP

- ☑ Less than \$150/line extra for ADSL/voice combo cards over voice-only cards
- ☑ Modest increases in ATM capacity to support data throughputs in addition to voice
- ☑ Cost of interoffice data network and ISP charges

⌘ Cost of 100% ADSL-provisioned basic LEAP is:

- ☑ \$150/line over 0% ADSL-provisioned basic LEAP, or
- ☑ \$280/line over current forward-looking network

# Short-run investments

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⌘ Copper < 18 kft.

☒ tNGDLC-inLSO, ATM and VGW

⌘ Copper > 18 kft.

☒ Fiber feeder, tNGDLC-RT, ATM and VGW

⌘ UDLC

☒ RT changeout to tNGDLC, ATM and VGW

⌘ IDLC/Pronto

☒ RT upgrade to tNGDLC, ATM and VGW

# Implementation strategy

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- ⌘ Legal authority and precedents
- ⌘ Carrots
- ⌘ Financing
- ⌘ Schedule
- ⌘ Linkages to other FCC proceedings



# Conclusion

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## ⌘ LEAP offers real benefits

- ☑ Enables ubiquitous DSL/advanced services
- ☑ May also decrease costs
- ☑ Enables maximal facilities-based competition
- ☑ Eliminates hot cuts and reduces collocation requirements
- ☑ Enables evolution to converged advanced networks of the future
- ☑ Enables greater reliability and security
- ☑ Reinvigorates telecom and advanced service applications investment